Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery Between 1 April and 30 June, 2008

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Background

The U.S. Atlantic Pelagic Longline fleet operates throughout the Northwestern Atlantic Ocean including along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean. The longline fishery has a documented history of incidental takes of non-target species including sea turtles and marine mammals. In June 2004, regulations were implemented to reduce interactions with sea turtles by requiring the use of "circle" hooks. The Biological Opinion also required quarterly reporting of interactions with protected species including sea turtles and marine mammals. The goal of this measure is to more closely monitor any short-term changes in interaction rates to allow more responsive management. This report meets this requirement and includes the observed fishery effort and incidental takes reported by the Pelagic Observer Program (POP) from 1 April to 30 June 2008.

While it is desirable to estimate the absolute level of takes (i.e. the total number of turtles or mammals estimated to be taken by the fishery), fishery effort data are reported on logbook forms by fishing captains, and current data are therefore not available until several months after the end of any given quarter. Therefore, the bycatch rate (i.e. catch per unit effort) is presented in this report based solely on observer data as an indicator of the relative level of interactions with protected species. The observed bycatch rate by fishing area during quarter 2 of 2008 is compared to that observed in quarter 2 during the three year period prior to implementation of regulations (2002-2004) and after (2005-2007) to determine if the current rates are unusually high or low. Bycatch rates were calculated by fishing area (Figure 1) using the delta log-normal method using hooks as the unit of effort. The analytical methods were described in detail in Garrison (2003).

Results and Discussion

During most of the second quarter of 2008, observer coverage in the Gulf of Mexico (GOM) fishing area was greatly enhanced to collect more robust information on catch of spawning blue-fin tuna (BFT) in the GOM and collect biological samples from BFT. The POP was tasked with

attempting to achieve 100% observer coverage in the GOM fishery on trips departing between 15 April and 15 June 2008. A similar effort was conducted during 2007. This enhanced coverage resulted in the observation of 545 sets (416,467 hooks) in the GOM during the second quarter. This coverage level is considerably higher than that in years prior to 2007.

A total of 597 longline sets (449,599 hooks) were observed during quarter 2 of 2008 (Table 1) during normal fishing effort with only circle hooks (16/0 and 18/0) recorded. Due to the enhanced coverage in the GOM, the majority of the observed sets occurred in that fishing area (Figure 1).

In addition, a cooperative research program with NOVA Southeastern University was conducted during the second quarter of 2008 that included longline fishing inside and outside of areas normally closed to fishing in the FEC and SAB areas. These experiments included 10 sets and a total of 5,415 hooks fished inside of closed areas. Additional experimental fishing was conducted in the GOM region testing the effectiveness of "weak" hooks as a potential bycatch mitigation tool. Experimental fishing in the GOM included 61 sets and 36,897 hooks. The experimental fishing, and associated bycatch, is not included in estimates of bycatch rates because they are not representative of the normal fishing effort.

The locations of observed sets and turtle interactions are shown in Figure 1. During normal fishing, there were 49 observed interactions with leatherback turtles and 7 observed interactions with loggerhead turtles (Table 2). Two leatherbacks were reported dead and one was released with unknown status in the GOM. All of the loggerhead turtles were released alive (Appendix A). Four leatherback turtles were observed captured in the experimental fishing in the GOM, and all were released alive.

Concerted efforts by fishers to remove hooks and disentangle captured turtles are mandated by the Biological Opinion. Specific information on injuries to sea turtles and gear characteristics of each interaction are shown in Appendix A. The release status for all turtles is summarized in Table 3. Of the 53 leatherback turtles observed captured (including those in experimental fishing), 40 were released with either all gear removed or with the hook and trailing line less than one-half the carapace length. There were three leatherback turtles released entangled, and it is not known whether an additional two were released entangled. There were two observed mortalities of leatherbacks. All 7 captured loggerhead turtles were released alive with all gear removed or with the hook and trailing line less than one-half the carapace length (Table 3).

Four interactions were observed with marine mammals during this quarter, all in the GOM area (Table 4, Figure 2). Two Risso's dolphins were considered seriously injured based upon NOAA guidelines (Angliss and Demaster, 1998). One animal was released with a significant amount of trailing line and the other was hooked in the mouth and released with significant amounts of trailing line. The sperm whale was entangled in the mainline and other gear and was accompanied by a calf. The mainline broke when the whale dove and gear remained on the animal. However, because this is a large whale it was not considered seriously injured. Finally, the killer whale was entangled around the tailstock, but all gear was removed before release. This is the first observed interaction with a sperm whale in the longline fishery and the second with a killer whale.

The quarterly and regional bycatch rates are summarized for sea turtles in Table 5 and for marine mammals in Table 6. These rates were compared with those from the same quarter/area for 2002-2004 before the implementation of the circle hook regulations and the average for 2005-2007 after implementation (Tables 7 and 8)

For leatherback turtles, the observed bycatch rate in 2008 was higher than the recent three-year average, but still below that from 2002-2004. Likewise, leatherback bycatch in the MAB was not observed between 2005-2007; however, the 2008 rate is below the 2002-2004 average (Table 7A). For loggerhead turtles, the bycatch rate for 2008 in the FEC was lower than that from 2005-2007 and 2002-2004. However, the 95% confidence limits for all three periods overlap, and the differences are not statistically significant. The observed bycatch rates in the GOM for 2005-2007 and 2008 are substantially lower than those observed from 2002-2004. However, the bycatch rates in both the MAB and SAB during 2008 are higher than either of the two historical periods.

For marine mammals, the high level of observer coverage during the 2nd quarter in both 2008 and 2007 has resulted in observed interactions with a diverse suite of species but at very low interaction rates. Prior to this enhanced coverage, very few marine mammal interactions had been observed in the Gulf of Mexico. In the MAB, the number of observed sets during the 2nd quarter of 2008 was relatively high compared to previous years, but no bycatch was observed (Table 8).

There are a number of caveats and uncertainties associated with the current analysis. First, while these data have undergone an initial audit and review, they are subject to change upon further review after the end of the 2008 calendar year when all logbook data are available. Second, the delta log-normal estimator was applied to calculate bycatch rates consistent with previous estimates (e.g., Garrison 2003). This approach assumed 1) that catch rates (animals per hook) were log-normally distributed, and 2) that the number of hooks was an appropriate unit of effort. The first assumption has been evaluated for turtles; however, violations of this assumption may have resulted in biased (positive or negative) estimates of catch rate and associated variances. The second assumption has not been examined critically in previous analyses. If this assumption was not correct, for example if there were saturation effects resulting in a non-linear relationship between the number of hooks and total catch, then there potentially may have been a bias in the estimate of bycatch rates.

The interaction between longline gear and protected species is a relatively rare event and is therefore inherently variable. Historically, there have been very large inter-annual fluctuations in bycatch rates and estimates of total bycatch. Thus, any differences observed between short term observations of bycatch rates and long term averages may be simply stochastic events and are not necessarily indicative of a significant change in the interactions between the longline fishery and protected species.

Literature Cited

Angliss, R.P. and D.P. DeMaster. 1998. Differentiating Serious and Non-Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop 1-2 April 1997, Silver Spring, Maryland. NOAA Technical Memorandum NMFS-OPR-13: 48 p.

Garrison, L.P. 2003. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2001-2002. NOAA Technical Memorandum NOAA NMFS-SEFSC-515: 52 p.

Table 1. Number of sets and hooks observed in the U.S. Atlantic Pelagic Longline Fishery between 1 April and 30 June, 2008 by fishing area during (A) normal and (B) experimental fishery operations.

A. Normal Fishing

Area	Sets	Hooks
CAR	0	0
FEC	23	9,797
GOM	545	416,467
MAB	11	8,670
NCA	0	0
NEC	0	0
NED	0	0
SAB	18	14,665
SAR	0	0
TUN	0	0
Total	**597**	**449,599**

B. Experimental Fishing

Area	Sets	Hooks
CAR	0	0
FEC	1	500
GOM	61	36,897
MAB	0	0
NCA	0	0
NEC	0	0
NED	0	0
SAB	9	4,915
SAR	0	0
TUN	0	0
TUS	0	0
Total	**71**	**42,012**

Table 2. Total observed interactions with marine turtles in the U.S. Atlantic Pelagic Longline Fishery for sets beginning between 1 April – 30 June, 2008 by fishing area during (A) normal and (B) experimental fishing operations. Areas with missing values indicate no observer coverage during this time period.

A. Normal Fishing

Area	Leatherback	Loggerhead
CAR	-	-
FEC	0	1
GOM*	48	3
MAB	1	1
NCA	-	-
NEC	-	-
NED	-	-
SAB	0	2
SAR	-	-
TUN	-	-
Total	**49**	**7**

* 2 leatherbacks were reported as dead and one with unknown status in GOM area.

B. Experimental Fishing

Area	Leatherback	Loggerhead
CAR	-	-
FEC	0	0
GOM	4	0
MAB	0	0
NCA	-	-
NEC	-	-
NED	-	-
SAB	0	0
SAR	-	-
TUN	-	-
Total	**4**	**0**

Table 3. Released status and gear removal for sea turtles captured in the U.S. Atlantic Pelagic Longline Fishery during April 1 – 30 June 2008. This includes leatherback turtles captured during experimental fishing.

Release Status	Leatherback	Loggerheads
Released entangled	3 (+2 unknown)	0
Released with hook and line ≥ ½ carapace length	10	0
Released with hook and line ≤ ½ carapace length	19	3
Released with all gear removed	21	4

Table 4. Interactions with marine mammals observed during 1 April – 30 June, 2008 in the U.S. Atlantic Pelagic Longline Fishery by fishing area during normal fishing operations. Observer comments and criteria described in Angliss and DeMaster (1998) were used to evaluate serious injury.

Species	Region	# Released Un-injured	# Dead	# Serious Injury
Risso's Dolphin	GOM	0	0	2
Killer Whale	GOM	1	0	0
Sperm Whale	GOM	1	0	0

Table 5. Estimated bycatch rate (Catch per 1000 hooks) for (A) Leatherback and (B) Loggerhead turtles by geographic area and during 1 April – 30 June, 2008 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. Missing values indicate areas with no observer coverage. CV indicates the coefficient of variation of the estimated rate.

A. Leatherback Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	23	0	0	-	-
GOM	Alive	545	42	0.1372	0.1667	0.1000 – 0.1881
GOM	Dead	545	2	0.0043	0.7072	0.0012 – 0.0144
GOM	Unknown	545	1	0.0027	1.0000	0.0006 – 0.0132
MAB	Alive	11	1	0.1083	1.0000	0.0221 – 0.5290
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	18	0	0	-	-
SAR	Alive	0	-	-	-	-
TUN	Alive	0	-	-	-	-

B. Loggerhead Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	23	1	0.0921	1.0000	0.0188 – 0.4503
GOM	Alive	545	3	0.0062	0.5763	0.0022 – 0.0171
MAB	Alive	11	1	0.1044	1.0000	0.0214 – 0.5108
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	18	2	0.1315	0.6913	0.0399 – 0.4327
SAR	Alive	0	-	-	-	-
TUN	Alive	0	-	-	-	-

Table 6. Estimated bycatch rate (Catch per 1000 hooks) for marine mammals by geographic area and quarter during 1 April – 30 June, 2008 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. CV indicates the coefficient of variation of the estimated rate.

Species	Serious Injury ?	Area	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
Risso's Dolphin	Y	GOM	545	2	0.0055	0.7207	0.0016 – 0.0189
Killer Whale	N	GOM	545	1	0.0047	1.000	0.0010 – 0.0230
Sperm Whale	N	GOM	545	1	0.0022	1.000	0.0004 – 0.0106

Table 7. Bycatch rates for (A) Leatherback turtles and (B) Loggerhead turtles in the U.S. Atlantic Pelagic Longline fishery during 1 April – 30 June, 2008 comparison to the second quarter average rate from 2002-2004 and the average rate from 2005-2007. 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a lognormal distribution of rates. These rates reflect combined alive, dead and unknown turtles.

A. Leatherback turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2007 CPUE	2005-2007 95% CI	2008 CPUE	2008 95% CI
CAR	0.0598	0.0122 - 0.2924	0.0789	0.0161 - 0.3858	-	-
FEC	0.1847	0.0517 - 0.6602	0.0583	0.0119 - 0.2849	0	-
GOM	0.292	0.2123 - 0.4017	0.0786	0.0573 - 0.1078	0.1440	0.1058 – 0.1960
MAB	0.3561	0.1745 - 0.7264	0	-	0.1082	0.0221 – 0.5290
NCA	0.0384	0.0079 - 0.1877	0	-	-	-
NEC	0.0814	0.0167 - 0.3979	0.3223	0.1401 - 0.7415	-	-
NED	-	-	-	-	-	-
SAB	0.0436	0.0157 - 0.1215	0	-	0	-
SAR	0	-	-	-	-	-
TUN	-	-	-	-	-	-

B. Loggerhead Turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2007 CPUE	2005-2007 95% CI	2008 CPUE	2008 95% CI
CAR	0.0575	0.0118 - 0.2809	0	-	-	-
FEC	0.2195	0.0571 - 0.8446	0.1397	0.0506 - 0.3858	0.0921	0.0188 – 0.4502
GOM	0.0582	0.0305 - 0.1111	0.0171	0.0083 - 0.0351	0.0062	0.002 – 0.0171
MAB	0	-	0	-	0.1044	0.0214 – 0.5107
NCA	0.2324	0.0945 - 0.5719	0.0842	0.0172 - 0.4115	-	-
NEC	1.3817	0.7107 - 2.6863	0.1408	0.0433 - 0.458	-	-
NED	-	-	-	-	-	-
SAB	0.0714	0.0294 - 0.1735	0	-	0.1315	0.0399 – 0.4237
SAR	0	-	-	-	-	-
TUN	-	-	-	-	-	-

Table 8. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery during 1 April – 30 June, 2008 comparison to the second quarter average rate from 2002-2004 and the average rate from 2005-2007. 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a lognormal distribution of rates. CPUEs reflect total marine mammals caught including alive, dead, and seriously injured animals.

Species	Area	2002-2004 CPUE	2002-2004 95% CI	2005-2007 CPUE	2005-2007 95% CI	2008 CPUE	2008 95% CI
Risso's Dolphin	GOM	0		0		0.0055	0.0016 – 0.0189
Killer Whale	GOM	0	-	0	-	0.0047	0.0010 – 0.0230
Sperm Whale	GOM	0	-	0	-	0.0022	0.0004 – 0.0106
Cuvier's Beaked Whale	GOM	0	-	0.0019	0.0003 – 0.0091	0	-
Unidentified Dolphin	GOM	0	-	0.0364	0.0011 – 0.0122	0	-
Bottlenose Dolphin	GOM	0	-	0.0023	0.0005 – 0.0113	0	-
Pilot Whale	GOM	0	-	0.0017	0.0004 – 0.0084	0	-
Risso's Dolphin	NEC	0.1389	0.0284 – 0.6789	0	-	-	-
Minke Whale	NEC	0.0882	0.0180 – 0.4311	0	-	-	-
Bottlenose Dolphin	NCA	0.3840	0.0079 – 0.1877	0	-	-	-
Atlantic Spotted Dolphin	MAB	0.0417	0.0085 – 0.2037	0	-	0	-
Pilot Whale	MAB	0.0338	0.0069 – 0.1652	0.2057	0.0638 – 0.6632	0	-

Figure 1. Observed Pelagic Longline effort and turtle interactions during 1 April – 30 June, 2008. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C, closed 1 Feb – 30 Apr) and in the Mid-Atlantic (D, closed 1 June – 30 June).

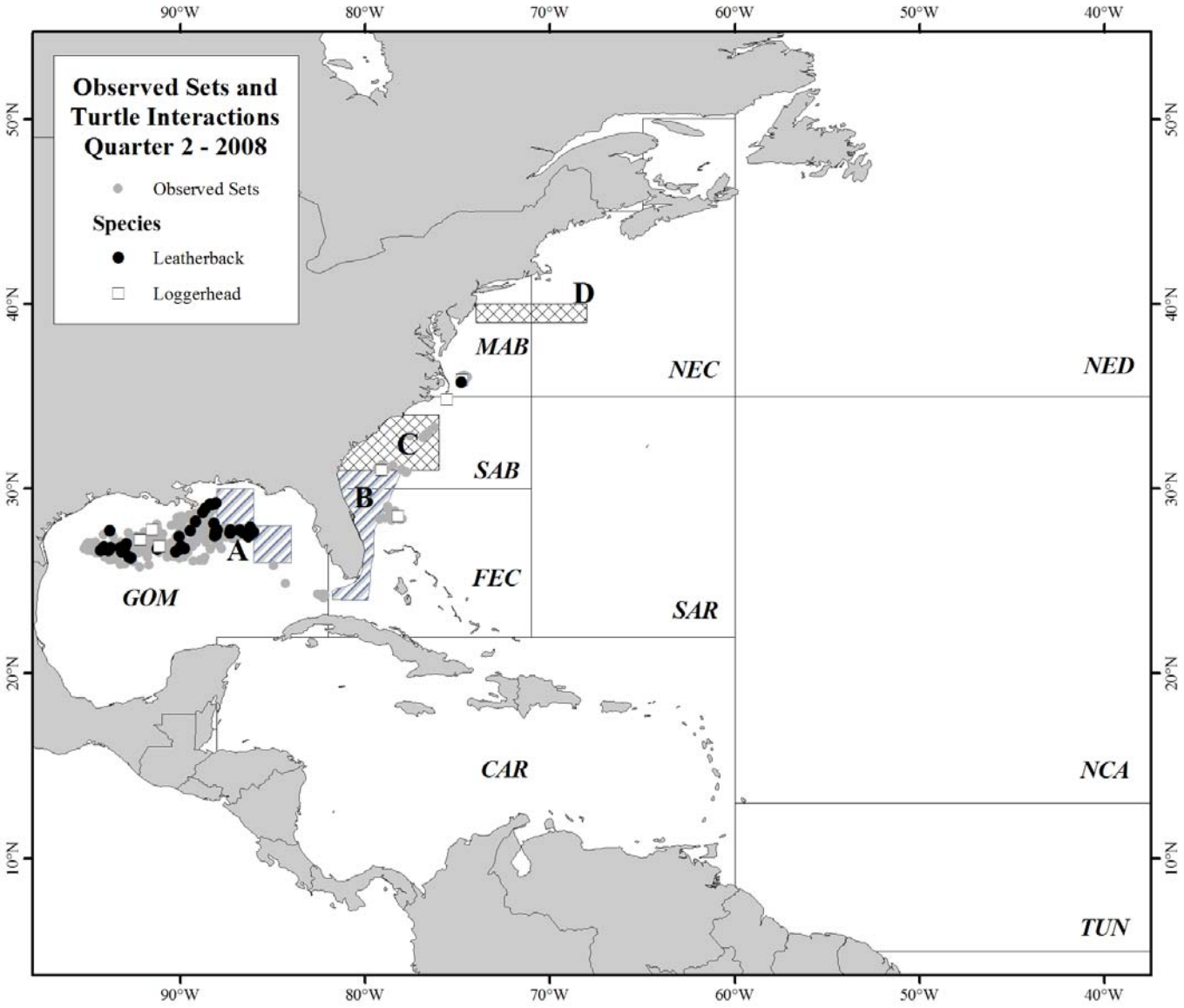
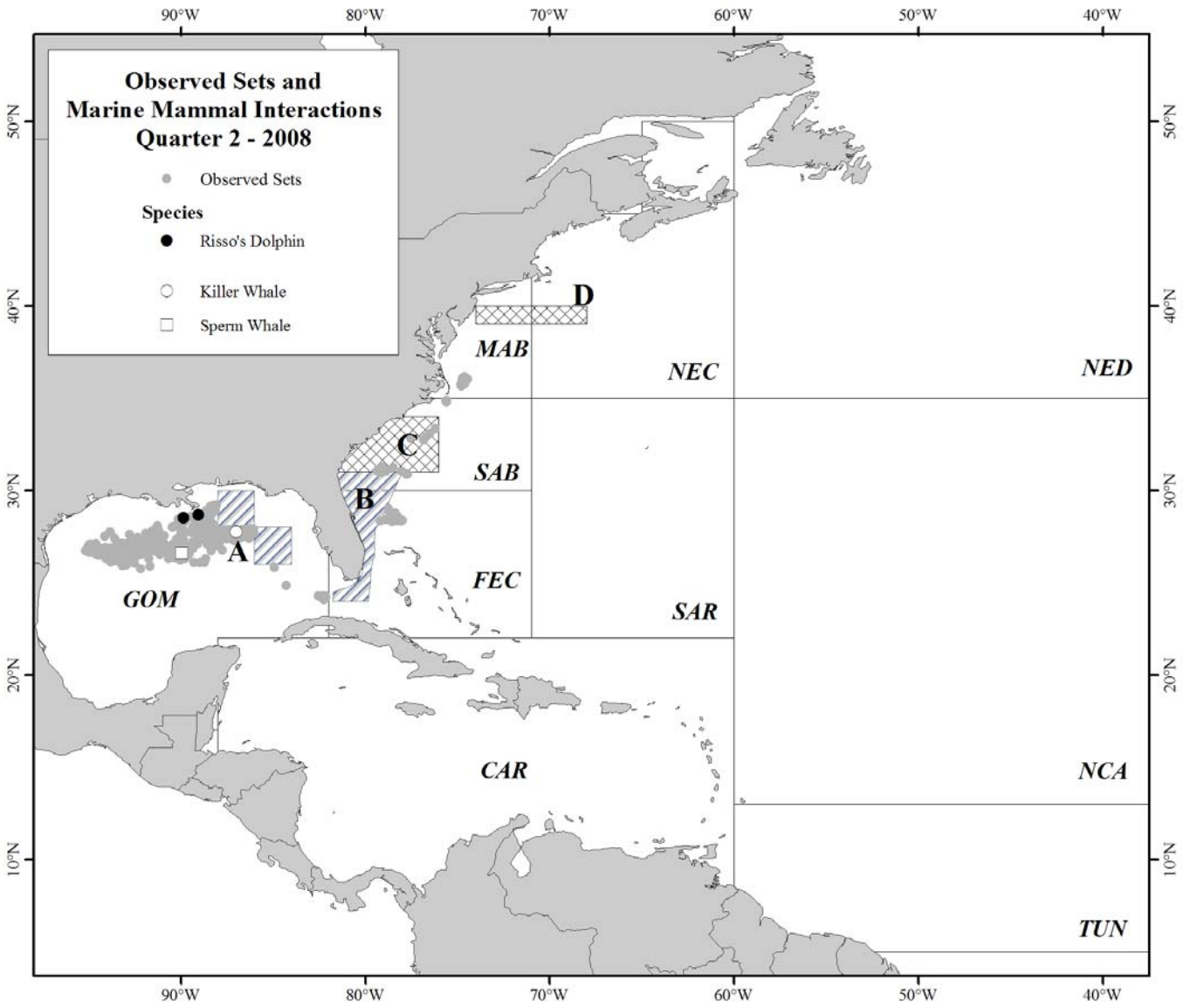


Figure 2. Observed Pelagic Longline effort and marine mammal interactions during 1 April – 30 June, 2008. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C, closed 1 Feb – 30 Apr) and in the Mid-Atlantic (D, closed 1 June – 30 June).



Appendix A: Injury details and hook type for turtles captured in the U.S. Atlantic Pelagic Longline Fishery for sets during 1 April– 30 June 2008. Area GOM-E indicates turtles taken during experimental fishing in the Gulf of Mexico.

A1. Leatherback Turtles

#	Species	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	Leatherback	GOM	C-16/0	0	squid	194	Alive, injured	Released alive	beak internal, unknown	Yes	No	No	0.00	5.50		
2	Leatherback	GOM	C-16/0	0	squid	194	Alive, injured	Released alive	mouth, lower, other	Yes	No	No	0.00	5.50		
3	Leatherback	GOM	C-16/0	0	squid	194	Alive, injured	Released alive	beak internal, unknown	Yes	No	No	0.00	5.50		
4	Leatherback	GOM	C-16/0	0	squid	100	Alive, injured	Released alive	front flipper	Yes	No	No	0.00	5.00		
5	Leatherback	GOM	C-16/0	0	squid or mackerel	210 or 192	Alive, injured	Released alive	carapace	Yes	No	No	0.00	4.00		
6	Leatherback	GOM	C-18/0	10	squid or mackerel	209	Alive, injured	Released alive	shoulder	No	No	No	1.00	6.00		
7	Leatherback	GOM	C-16/0	0	squid or mackerel	208 or 222	Alive, injured	Released alive	shoulder	Yes	Yes	No	0.00	5.00		
8	Leatherback	GOM	C-16/0	0	squid or mackerel	222 or 208	Alive, injured	Released alive	shoulder	No	No	No	1.00	5.00		
9	Leatherback	GOM	C-16/0	0	squid or mackerel	233 or 175	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	4.00		
10	Leatherback	GOM	C-16/0	0	squid or mackerel	208 or 167	Alive, injured	Released alive	shoulder	No	No	No	1.00	5.00		
11	Leatherback	GOM	C-16/0 or C-18/0	0 or 10	squid or mackerel	208 or 222	Alive, injured	Released alive	shoulder	No	No	No	1.00	5.00		
12	Leatherback	GOM	C-16/0	0	squid	149	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	4.00		
13	Leatherback	GOM	C-16/0	0	squid	166	Unknown	Unknown	not known if hooked	Yes	Unknown	No	0.00	6.00		
14	Leatherback	GOM	C-16/0	0	squid	173	Alive, injured	Released alive	shoulder	No	No	No	0.50	4.00		
15	Leatherback	GOM	C-16/0	0	herring	110	Fresh dead	Discarded unmarked carcass	not hooked	n/a	Yes	No	0.00	4.60		

Appendix A1 – Leatherback Turtles cont.

#	Species	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
16	Leatherback	GOM	C-16/0	0	squid	131	Alive, injured	Released alive	plastron	No	No	No	3.50	4.00		
17	Leatherback	GOM	C-16/0	0	squid	131	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	5.00		
18	Leatherback	GOM	C-16/0	0	squid	171	Alive, injured	Released alive	armpit	No	No	No	1.00	6.00		
19	Leatherback	GOM	C-16/0	0	squid	171	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	5.00		
20	Leatherback	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.00	4.00		
21	Leatherback	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	upper, roof of mouth	No	No	No	0.20	3.00		
22	Leatherback	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	upper, roof of mouth	No	No	No	0.20	3.50		
23	Leatherback	GOM	C-16/0	0	squid	198	Alive, injured	Released alive	shoulder	No	Yes	No	0.10	5.00		
24	Leatherback	GOM	C-16/0	0	sardine	131	Alive, injured	Released alive	tail	Yes	Yes	No	0.00	3.00		
25	Leatherback	GOM	C-16/0	0	squid	225	Alive, uninjured	Released alive	not hooked	n/a	Yes	Yes	2.00	6.00		
26	Leatherback	GOM	C-16/0	0	squid	225	Alive, injured	Released alive	shoulder	No	No	No	1.00	5.00		
27	Leatherback	GOM	C-16/0	0	squid	225	Alive, unknown	Released alive	not known if hooked	No	Unknown	Unknown	8.00	6.00		
28	Leatherback	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	front flipper	No	No	No	30.00	4.00		
29	Leatherback	GOM	C-16/0	0	squid	144	Alive, injured	Released alive	shoulder	No	No	No	2.50	6.00		
30	Leatherback	GOM	C-16/0	0	squid	198	Alive, injured	Released alive	unknown location	No	No	No	10.00	7.00		
31	Leatherback	GOM	C-16/0	0	squid	140	Alive, injured	Released alive	shoulder	No	No	No	0.30	4.00		
32	Leatherback	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	front flipper	No	No	No	0.50	5.00		

Appendix A1 – Leatherback Turtles cont.

#	Species	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
33	Leatherback	GOM	C-16/0	0	squid	176	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	4.00		
34	Leatherback	GOM	C-16/0	0	squid	176	Alive, injured	Released alive	beak internal, upper jaw	Yes	No	No	0.00	5.00		
35	Leatherback	GOM	C-16/0	0	squid	176	Fresh dead	Discarded unmarked carcass	not known if hooked	No	Yes	Yes	11.00	6.00		
36	Leatherback	GOM	C-16/0	0	squid	176	Alive, injured	Released alive	front flipper	No	Yes	Yes	2.00	5.00		
37	Leatherback	GOM	C-16/0	0	squid	176	Alive, injured	Released alive	front flipper	No	No	No	9.00	6.00		
38	Leatherback	GOM	C-16/0	0	squid	112.5	Alive, injured	Released alive	armpit	No	No	No	1.00	4.50		
39	Leatherback	GOM	C-16/0	0	squid	112.5	Alive, injured	Released alive	armpit	No	No	No	1.00	5.00		
40	Leatherback	GOM	C-16/0	0	sardine	63	Alive, injured	Released alive	shoulder	No	No	No	6.00	4.00		
41	Leatherback	GOM	C-16/0	0	sardine	75	Alive, unknown	Released alive	not known if hooked	No	Unknown	Unknown	60.00	6.00		
42	Leatherback	GOM	C-16/0	0	sardine	75	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	6.00		
43	Leatherback	GOM	C-16/0	0	squid	197	Alive, injured	Released alive	armpit	No	No	No	0.30	4.50		
44	Leatherback	GOM	C-16/0	0	squid	197	Alive, injured	Released alive	shoulder	No	No	No	0.30	4.50		
45	Leatherback	GOM	C-16/0	0	squid	203	Alive, injured	Released alive	armpit	No	No	No	0.30	4.50		
46	Leatherback	GOM	C-16/0	0	squid	170	Alive, injured	Released alive	side jaw joint	No	No	No	0.50	5.00		
47	Leatherback	GOM	C-16/0	0	squid	170	Alive, injured	Released alive	shoulder	No	No	No	5.00	4.00		
48	Leatherback	GOM	C-16/0	0	squid	170	Alive, injured	Released alive	shoulder	No	No	No	20.00	6.00		
49	Leatherback	MAB	C-16/0	0	squid	150	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	3.50		

Appendix A1 – Leatherback Turtles cont.

#	Species	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
50	Leatherback	GOM-E	C-16/0	0	sardine	77	Alive, uninjured	Released alive	not hooked	n/a	Yes	No	0.00	4.00		
51	Leatherback	GOM-E	C-16/0	0	sardine	75	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	5.00		
52	Leatherback	GOM-E	C-16/0	0	sardine	75	Alive, injured	Released alive	front flipper	Yes	No	No	0.00	5.00		
53	Leatherback	GOM-E	C-16/0	0	sardine	77	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	4.00		

A2. Loggerhead Turtles

#	Species	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	Loggerhead	FEC	C-18/0	10	squid	117	Alive, injured	Released alive	swallowed	No	No	No	0.10		64.1	59.2
2	Loggerhead	GOM	C-16/0	0	squid	153	Alive, injured	Released alive	shoulder	Yes	No	No	0.00		78	70
3	Loggerhead	GOM	C-16/0	0	squid	198	Alive, injured	Released alive	unknown, internal	No	No	No	0.40	4.00		
4	Loggerhead	GOM	C-16/0	0	squid	149	Alive, injured	Released alive	front flipper	No	No	No	1.00	2.50		
5	Loggerhead	MAB	C-16/0	0	squid	150	Alive, injured	Released alive	tongue	Yes	No	No	0.00		81	73
6	Loggerhead	SAB	C-16/0	0	squid	59	Alive, injured	Released alive	mouth, unknown	Yes	No	No	0.00	3.00		
7	Loggerhead	SAB	C-16/0	0	sardine	72	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.00		64	